



A Clinical Study on Outcome of Tympanoplasty in Relation to Middle Ear Risk Index

Dr V. U. Shanmugam¹, Dr Yuvaraj Radhakrishnan², Dr Balaji Swaminathan³, Dr Ruta Shanmugam⁴,
Dr Prakash⁵

^{1,4}Professor, ²Post Graduate, ³Professor and HOD, ⁵Senior Resident
Dept of ENT, RMMCH, Annamalai University, Chidambaram

***Corresponding Author:**

Dr Ruta Shanmugam

Professor, Dept of ENT, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram

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Abstract

Objectives: To find out the association between the Middle Ear Risk Index and outcome of tympanoplasty

Methodology: A total of 30 patients underwent Tympanoplasty procedure. Detailed assessment and examination was done in all patients with Chronic Otitis Media (COM). Middle Ear Risk Index (MERI) score was calculated for all the patients and patients were categorized based on Middle Ear Risk Index (MERI) score. Tympanoplasty procedure was performed.

Results: Data was analyzed by using Microsoft Excel Spreadsheet 2019. Chi square test was employed to find out the association between MERI and outcome of tympanoplasty.

Conclusions: COM patients with lower MERI score had a greater chance of graft acceptance than patients with higher MERI score. Patients with severe MERI score had more chance of graft rejection in tympanoplasty. Preoperative reduction of risk factors such as otorrhea, granulations and smoking improves the success rate of tympanoplasty.

Keywords: chronic otitis media (COM), tympanoplasty, middle ear risk index (MERI)

Introduction

Chronic otitis media is a highly prevalent middle ear disease particularly in developing countries like India.

It causes numerous pathological changes in middle ear cleft like Tympanic membrane perforation, Tympanosclerosis, Ossicular erosion, Cholesteatoma, Granulation, Polyps etc. Tympanoplasty is a surgical procedure which involves reconstruction of the middle ear cavity, tympanic membrane and restoration of the sound conducting tympano-ossicular system.

The results of tympanoplasty depends, largely on the preoperative severity of disease in the middle ear

Middle Ear Risk Index developed by Becvarovski and Kartush derives these Risk factors in the middle

ear into a numerical value to predict the outcome of tympanoplasty.

Each patient is assigned a numerical score based on the risk factors. The total score is 12. Based on MERI score, the patients are classified as mild disease (1-3), moderate disease (4-6) and severe disease (7-12). It was modified in 2001 in which smoking was added as a risk factor.

AIMS AND OBJECTIVES

To study the association between Middle Ear Risk Index and outcome of tympanoplasty in patients with COM

To find out the pattern of Middle Ear Risk Index among the patients with COM who have indication for tympanoplasty.

To find out the association between size of perforation and outcome of tympanoplasty.

MATERIALS AND METHODS

This study was conducted in the Department of Otorhinolaryngology, Government Cuddalore Medical College (Raja Muthiah Medical College Hospital), Chidambaram, Tamilnadu from October 2019 to November 2021 among 30 patients with COM, both Mucosal and Squamous type.

Inclusion Criteria

Patients attending ENT outpatient department with both Mucosal type of COM and Squamous type of COM and with indication for tympanoplasty.

Exclusion Criteria

1. Patients with systemic illness like diabetic mellitus
2. Patients not willing for surgery

Method of Study

The study was conducted after obtaining clearance from ethical committee. All the patients attending the ENT department during the study period with complaints of ear discharge, hearing loss, history of smoking and previous ear surgery were taken into consideration for the study. A detailed history was taken and clinical examinations, Otosopic, otomicroscopy examination was done to find out the presence of perforation, granulation tissue and cholesteatoma.

Routine basic investigations such as CBC, PTA and CT temporal bone was done for all patients. Otoscopic findings were confirmed with the help of otoendoscopy, otomicroscopy. At the end of history taking, clinical examination and laboratory investigations, patients who were diagnosed to have both COM and indication for typanoplasty was taken into the study. Informed consent was obtained from all the study participants. For all the above selected study participants, Middle Ear Risk Index was calculated ⁽¹⁾. Table 1 shows various factors involved in calculating MERI.

Table 1: Middle Ear Risk Index (MERI)

Risk Factor	Risk Value
Otorrhea	Dry - 0
	Occasionally Wet - 1
	Persistently wet - 2
	Wet ear with cleft palate - 3
Perforation	Absent - 0
	Present - 1
Cholesteatoma	Absent - 0
	Present - 2
Ossicular chain	Malleus, incus and stapes present - 0
	Defect of incus - 1
	Defect of incus and stapes -2
	Defect of incus and malleus - 3
	Defect of melleus, incus and stapes - 4
Middle ear granulation / effusion	No- 0
	Yes 2

Previous surgery	None - 0
	Staged - 1
	Revision - 2
Smoker	No- 0
	Yes - 2

Patients were categorized into mild (1-3) moderate (4-6) and severe (7-12) based on MERI score. All the study participants will then undergo tympanoplasty. Type of tympanoplasty and mastoidectomy was planned preoperatively and decided intraoperatively based on the extent of the disease in the middle ear and mastoid. Temporalis fascia graft was used for all patients. Patient was reviewed every month postoperatively and outcome of tympanoplasty was measured after 3 months from the date of surgery by means of Otoroscopic, otomicroscopic examination and pure tone audiogram. During the otoscopic examination, status of graft was assessed as

1. Successful graft uptake
2. Graft failure or re-perforation of tympanic membrane

Pure tone audiogram helps to evaluate the air-borne gap changes that will occur postoperatively.

Statistical analysis

All the data collected was entered into Microsoft excel spreadsheet 2019 and was imported into SPSS version 23 for further analysis. Both Descriptive and inferential statistics was employed. Chi square test was employed to find out the association between MERI and outcome of tympanoplasty.

RESULTS

Table 2: Age Distribution

Age	No. of Patients	Percentage %
11 - 20 Years	6	20 %
21 - 30 Years	13	44 %
31 - 40 Years	7	23 %
41 - 50 Years	4	13 %

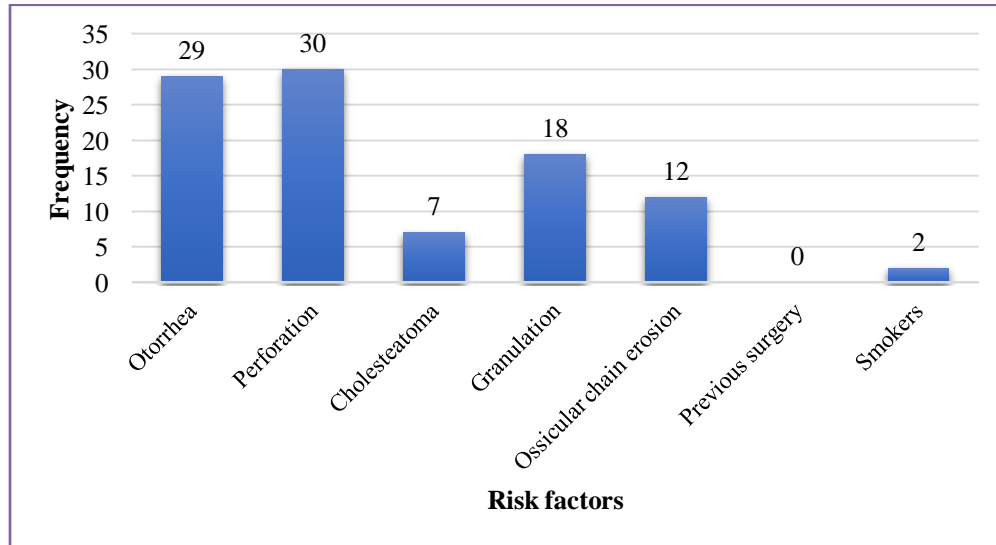
Table 3: Gender Distribution

Gender	No. of patients	Percentage %
Male	8	27 %
Female	22	73 %

Table 4: MERI Score Risk Factors Distribution

Risk Factors	Present	Absent
Otorrhea	29 (96.7 %)	1 (3.3 %)
Perforation	30 (100 %)	0 (0 %)

Cholesteatoma	7 (23.3 %)	23 (76.7 %)
Granulation	18 (60 %)	12 (40 %)
Ossicular chain erosion	12 (40 %)	18 (60 %)
Previous surgery	0 (0 %)	30 (100 %)
Smokers	2 (6.7 %)	28 (93.3 %)



Graph 1: Meri Score Risk Factors Distribution

In our study group out of the 30 patients 29 patients had otorrhea, all the 30 patients had perforation, 7 patients had cholesteatoma, 18 patients had granulation, 12 patients had ossicular chain defect and 2 patient had history of smoking. None of the patient had previous history of ear surgery.

Table 5: Type of COM vs MERI Score

	Mild	Moderate	Severe
Mucosal n = 23	11	11	1
Squamous n = 7	1	0	6

In our study 77% (n=23) of patients were affected with mucosal type of and 23% (n=7) patients were affected with Squamous type of COM.

Table 6: Size of Perforation vs Graft Status

Size of perforation	No. of patients	Graft taken up	Graft rejected
Small	0	0	0
Medium	18	16 (88%)	2(12%)
Large	12	7 (58%)	5(42%)



Graph 2: Size of Perforation vs Graft Status

Most of the patients had medium size perforation and they had high success rate of graft uptake about 88% as compared to large size perforation with 58% graft uptake.

Table 7: MERI Score with Graft Status

MERI Score with Graft Status						
		Outcome		Total	x ² - value	P-value
		Success	Failure			
MERI Score	Mild	11(91%)	1	12	6.145	0.046 *
	Moderate	9(82%)	2	11		
	Severe	3(57%)	4	7		
Total		23(77%)	7(23%)	30		

* Statistical Significance at p < 0.05 level

The above table shows comparison between MERI Score grades with Outcome of surgery by using Pearson’s Chi-square test were x²=6.145, p=0.046 < 0.05 and there was statistical significance between MERI Score grades and Outcome of surgery.



Graph 3: Graft Status vs MERI Score

Patients who had mild MERI score had greater graft uptake 91% (n=11) and patient with moderate MERI score has graft uptake 82% (n=9) than patients with severe MERI score 43% (n=3).

Table 8: MERI Score with Hearing Improvement

MERI Score with Hearing Benefit						
		Outcome		Total	x ² - value	p-value
		Hearing Improvement	No Hearing Improvement			
MERI Score	Mild	12(100%)	0	12	7.298	0.0462 *
	Moderate	10(90%)	1	11		
	Severe	4(57%)	3	7		
Total		26 (86.6%)	4 (13.4%)	30		
* Statistical Significance at p < 0.05 level						

The above table shows comparison between MERI Score grades with Outcome by using Pearson’s Chi-square test. In which $x^2=7.298$, $p=0.0462 < 0.05$ shows statistical significance between MERI Score grades with Hearing improvement. Higher the MERI score, lower is the patient’s chances of hearing improvement. Similarly, patients with low MERI scores have greater hearing benefit after surgery. Patient with mild MERI score had 100% (n=12) hearing improvement than those with severe MERI score 57% (n=4)

In this study 86.6% of patients had hearing improvement and was statistically significant. The mean score of hearing improvement is 14.38 dB.

DISCUSSION

Chronic otitis media is a very common Otorhinolaryngeal disease worldwide, especially in developing countries. Around 7.8% of the Indians suffer from this infection according to WHO report, 2004^[2]. It is more common in rural areas than urban areas and is associated with poor hygiene, illiteracy and is common among the middle and low income groups. In spite of the availability of wide range of antibiotics, better surgical techniques and newly developed prosthetic materials, we are still unable to reach 100% successful outcomes in tympanoplasty in terms of graft uptake and hearing benefit. This is probably due to the extent of pathology in the middle ear and mastoid which affects the outcome. MERI

index score is a useful tool to identify the extent of middle ear disease and the factors determining the outcome of surgery.

In our study the most common age group affected is in between 21 to 30 years (44%)^[3] and females (73%) are more commonly affected than males (27%)^[4].

In our study, 18 patients had medium size perforation out of which 16 patients (88%) had good graft uptake and 7 patients (58%) patients with large perforation had good graft uptake. Thus graft uptake is better in medium sized perforations than large sized perforations.^[5]

Granulation in middle ear predisposes to ossicular necrosis.^[6] In our study we observed 18 patients had granulations in which 12 patients had ossicular defect and 6 patients (33%) had graft rejection.

Smoking is associated with reduced graft uptake^[7]. In our study 2 patients had history of smoking in which one patient had graft rejection (50%).

In our study, success rate has been explained with reference to two different entities - graft status and hearing benefit. In our study, the overall success rate of tympanoplasty was 77% according to graft status. Grafts which are rejected or perforated are taken as failures, which was about 23%.^[8]

Our study conclude that there is higher graft rejection in patients with severe MERI scores and vice versa^[9].

The presence of cholesteatoma, size of tympanic membrane perforation, status of the ossicular chain, history of previous surgery and the overall sum of the MERI were highly significant pre-op negative prognostic factors influencing the outcome of tympanoplasty.

According to Belfast rule of thumb, postoperative hearing benefit is significant if air conduction threshold in speech frequency range is ≤ 30 dB or if interaural difference is ≤ 15 dB. In our study, we have measured the average air - bone gap closure at speech frequencies (500Hz, 1 kHz, 2 kHz and 3 kHz) based on the guidelines given by the committee on hearing and equilibrium, American academy of otolaryngology head and neck surgery.

In our study, overall 86% of patients had hearing improvement and 13.4% of patients had no hearing improvement. The mean score of hearing improvement is 14.38dB.

CONCLUSION

Preoperative MERI score was found to be a useful guide to predict the extent of disease as well as outcome of tympanoplasty. COM patients with lower MERI score had a greater chance of graft acceptance than patients with higher MERI score. Patients with severe MERI score had more chance of rejection of graft in tympanoplasty. Similarly medium size perforation had better graft uptake rather large perforation. Preoperative reduction of risk factors such as otorrhea, granulations and smoking improves the success rate of tympanoplasty.

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